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The North Pickering Project

Transit Studies (A Background Report)

De Leuw Cather, Canada Ltd.
Consulting Engineers and Planners

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NORTH PICKERING PROJECT

SPECIAL TRANSIT STUDIES

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NORTH PICKERING PROJECT

SPECIAL TRANSIT STUDIES

1. INTRODUCTION

1.1 THE REPORT

This report documents our examination of the role for public transit services within the North Pickering Project.

In brief, our general approach has been to develop a conceptual transit network configuration for the Preferred Concept using a ridership level based on the judgment and experience of the Consultant-Project Team. The implications of variations in this assumed ridership level are discussed.

Changes in the urban structure, specifically population distribution, were tested. Requirements for preferential treatment and effects of changes in land-use arrangements within the Central Area are discussed.

A large part of the analysis has focused on the development of a transit system to serve 75,000 population. However, the review was expanded to consider guidelines for public transportation if at some future time the Community were to grow beyond that target.

Guidelines are given for the initial implementation and staging of transit services in the Community.

The analysis described above incorporated specific assumptions related to the type and location of the regional transit system. The report concludes by outlining the possible consequences of other regional transit scenarios on the internal community structure and the local transit system.

1.2 BACKGROUND INFORMATION

The North Pickering Project (NPP) is being planned as a new community within the context of the plan for the Toronto-Centred Region. The development is for 75,000 to 90,000 people. Figure 1 illustrates the regional setting of the Community.

Table 1 gives the base data for the Community used for transportation planning purposes at a population level of 75,000. The assessment at a higher population level was conceptual, sufficient to identify the need for regional corridors and the preferred alignment through the site.

TABLE 1
ASSUMED SOCIO-ECONOMIC PARAMETERS FOR
NORTH PICKERING COMMUNITY WITH 75,000 POPULATION

<u>Population Distribution</u>		<u>Total</u>
Low density	- 8 persons/gross acre	25,000
Medium density	- 15 persons/gross acre	33,200
High density	- 40 persons/gross acre	16,400

Labour Force

30,000 at 40%* participation rate

Employment

- . Within NPP - 23,500 jobs*
- . At New Toronto International Airport (NTIA) - 10,000 jobs
- . Of 23,500 jobs in NPP, 9,000 are held by people who live in NPP.
- . Of 10,000 jobs at NTIA, 3,000 are held by people who live in NPP.

* Targets developed later in Recommended Plan: 42% and 31,500 jobs.



Fig. 1

Regional Setting

2. SERVICE DESIGN

The primary goals for public transit are listed below:

- . To offer an attractive alternative to the use of the private auto.
- . To provide a reliable, efficient, convenient and safe transit service for those without other means of travel.
- . To complement and support the land-use pattern developed for the Community.

Public service has become the major focus of transit system design. Management must balance the need for efficiency and productivity with the growing public and political desire to serve the totality of urban mobility needs.

As a result, the primary elements in the development of a transit system are:

- . the minimum service policies which define the basic service to be provided, and
- . the characteristics of the transit demand within the Community.

2.1 MINIMUM SERVICE POLICIES

The need is to formulate operating policies which ensure the planning of service is realistic in terms of what the Community wants and can afford. It is vital that the responsibilities of all groups involved

in policy-making and in the operation be clearly defined. Policies are meaningless unless there is an effective organizational structure to put them into effect and which can be held accountable for the results.

The minimum operating and management policies considered appropriate for the Community are given below:

<u>Item</u>	<u>Proposed Policy</u>
1. Area of Service	- transit service will be provided within urbanized area.
2. Service Coverage	<ul style="list-style-type: none">- all high-density development to be situated within 500-700 feet walking distance of a transit stop.- all medium-density development be within 700-900 feet of a transit stop.- all low-density residential be within a maximum of 1300 feet walking distance of a transit stop. On the average, a 1000-foot area of coverage should be provided for 80 percent of the population.
3. Hours of Service	
Monday-Saturday	- 18 hours of service on all routes
Sunday	- 10 hours of service on all routes
4. Frequency of Service	
Monday-Friday	- 15-minute frequency during peak period and 30-minute frequency during off-peak periods.

Saturday & Sunday - 30-minute frequency on all routes during the hours of operation.

Where warranted by demand service will be increased.

5. Transfers - not more than one transfer will be required between all points on the system.
6. Fare Structure - the fare structure will be set to meet all or part of the total cost of operation. Reduced fares will apply to students and senior citizens.
7. Financial - assuming a continuation of present provincial policy, the fare revenue on a system basis, and the amounts of subsidy to support reduced fares will be 50 percent of the total operating cost.

 - in specific areas where additional service is requested, the fare revenue will equal 50 percent of the marginal additional costs of providing the service.
8. Public Information - comprehensive and current information on services will be provided for the public. A continuing program will be maintained to encourage use and to determine areas for expansion of service.

2.2 CHARACTERISTICS OF DEMAND

Fundamental to the estimation of trip forecasts and distribution is an understanding of the strength of North Pickering's links to Metropolitan Toronto, Durham and other parts of the Toronto-Centred Region. Given its location and size, North Pickering cannot be considered as a free-standing Community in the transportation sense. The travel patterns of its residents will be affected by the location of jobs, of shopping, recreation and community facilities within the Region as a whole, as well as within the Community itself. The following estimated person-trip distribution illustrates a predominance of travel between the Community and outside centres.

2.2.1 Person-Trip Distribution

The person-trip forecast and distribution for the Community of 75,000 population has been derived by extrapolation from the Toronto and Region Model Study by the Ministry of Transportation and Communications.

The distribution of peak-hour person-trips is summarized below. Figure 2 illustrates the person-trip distribution graphically.

TABLE 2
ESTIMATED P.M. PEAK-HOUR PERSON-TRIP DISTRIBUTION

<u>Trip Interchange</u>	<u>Percent of Total Person-Trips</u>
11 - 11 NPP Internal Trips	22.0
. Central Area	6.0
. North Industrial Area	6.0
. East Industrial Area	6.0
. Other Employment Areas	4.0

<u>Trip Interchange</u>		<u>Percent of Total Person-Trips</u>
11 - 1	Region of York, North	1.0
11 - 2	Region of Peel Region of Halton	1.0
11 - 3	Region of York, South	5.0
11 - 4	Etobicoke City of Toronto York East York	13.0
11 - 5	Scarborough	24.0
11 - 6	Ajax Pickering Bay Ridges	12.0
11 - 7	Durham Region, North NTIA	4.0
11 - 8	Durham Region, South	2.0
11 - 9	Oshawa - Whitby	15.0
11 - 10	Newcastle	1.0
		<hr/> 100 percent <hr/>

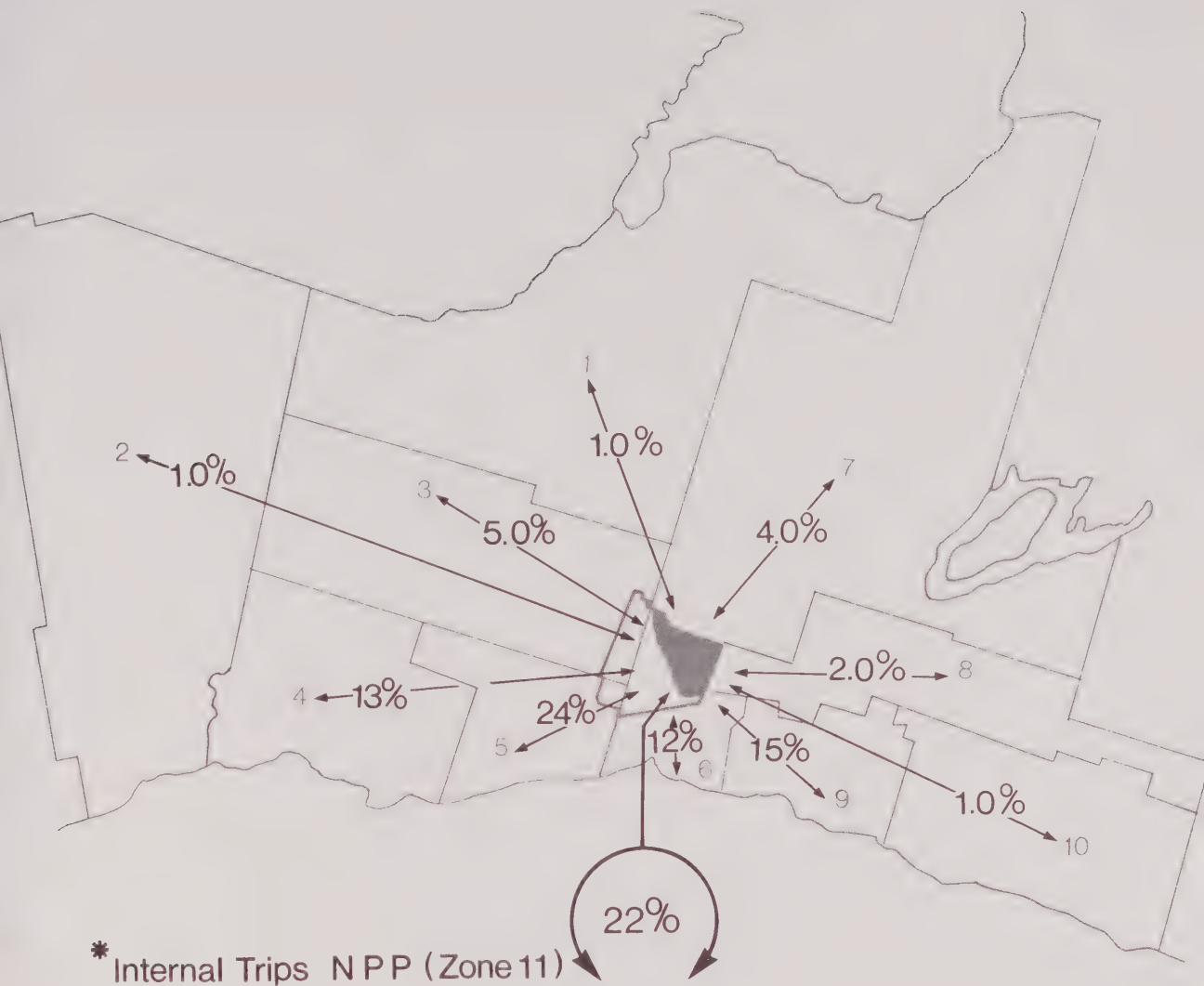


Fig. 2

P.M. Peak Hour Person Trip Distribution

Achievement of a 50% Live/Work target could materially increase this percentage.

2.2.2 Modal Split Analysis

Modal split to transit is a direct function of the attractiveness of the transit service provided. Most important is the ability of the system to provide reasonably direct service between the passenger's origin and destination.

As a large number of work person-trips will be related to centres elsewhere in the Region, the decision to use transit will depend upon how good transit is for the total trip, not just the part of it within the new community. As a result, the use of transit will be a function both of the convenience of the regional system to the outside centres and the level of service provided by the internal community system.

Modal Split Assumptions

The daily modal split to transit was assumed as 10 percent with a corresponding peak-hour modal split of 15 percent. Table 3 compares the daily modal split with figures for other communities of similar and larger size. The higher figures for North Pickering reflect the greater opportunities for transit in a planned community.

For each of the trip interchanges within the Community and between the Community and the external districts, a specific modal split to transit was assumed.

TABLE 3
COMPARATIVE RIDERSHIP STATISTICS*

<u>Community</u>	<u>Population**</u>	<u>Modal Split To Transit (24-Hour)</u>	<u>Annual Ridership Per Capita</u>
North Pickering Project	75,000	10.0%	75.
Guelph	58,000	7.4%	51.
Brantford	64,000	4.5%	31.
Niagara Falls	67,000	2.9%	20.
Sault Ste. Marie	80,000	4.1%	28.
Burlington	87,000	1.9%	13.
Oshawa	91,000	5.1%	35.
Thunder Bay	106,000	7.4%	51.
Kitchener-Waterloo	163,200	7.0%	48.
Mississauga	177,100	2.0%	14.0
London	219,200	12.0%	72.0

* Based on 1973 statistics for existing communities listed.

** Population included in service area.

Regional Transit Assumptions

The Municipality of Metropolitan Toronto has under consideration the construction of an intermediate capacity rapid transit system (ICTS) to serve the North-East Corridor. This would link the future TTC subway terminal at Kennedy-Eglinton with Scarborough Town Centre. If this line were built it would seem beneficial to extend it to serve the proposed International Airport (perhaps with a stop at the Zoo) passing through the designated open space system and through the Community. The analysis, therefore, assumed the extension of the proposed ICTS through the Central Area to the NTIA Terminal. Two stops would be located within the Community; one in the Central Area, the second in the North Industrial Area. This regional transit link would serve the trips destined to and from the Metro area and especially strengthen the connection between the Community and the Airport.

The short term and medium range transit linkage between the Community and the urban areas to the south and southeast was assumed to be an express bus service. The service would provide a direct connection between the Airport, the Community and Oshawa-Whitby as compared to providing a transfer connection at the Pickering GO-Transit Station. In the long term, the assumed ICTS could also, if so decided, provide a link to Oshawa in support of the T.C.R. land-use objectives.

The preferred ICTS corridor through the Community is illustrated in Figure 3. The significance to the Community lies in the location of the stations rather than the route itself. The implication of other regional transit system scenarios is discussed later in the report.

Transit Trip Distribution

The estimated P.M. peak-hour transit trip distribution is summarized in Table 4.



Fig. 3

Preferred Regional I.C.T.S. Corridor

TABLE 4
ESTIMATED P.M. PEAK-HOUR TRANSIT TRIP DISTRIBUTION

<u>District</u>	<u>Person-Trip Interchange</u>	<u>Modal Split Percentage Assumed</u>	<u>Transit Trip Interchange</u>
11 - 11 (Internal)	5,850	18.%	1,000
11 - 1	300	-	-
11 - 2	200	-	-
11 - 3	1,300	-	-
11 - 4	3,500	20.	700
11 - 5	6,500	20.	1,300
11 - 6	3,200	15.	500
11 - 7	1,100	10.	100
11 - 8	550	-	-
11 - 9	4,100	10.	400
11 - 10	200	-	-
	<hr/>	<hr/>	<hr/>
	26,800	15.	4,000
	<hr/>	<hr/>	<hr/>

Figure 4 illustrates the peak-hour trip distribution graphically. In our opinion, the achievement of a higher modal split to transit would likely depend on future limitations placed universally on the use of private transportation by virtue of higher operating costs, traffic congestion or parking restrictions. Under-achievement will likely be the result of a less attractive regional transit system. The implications of both are discussed in the final section of the report.

2.2.3 Demand Analysis Results

The main findings of the demand analysis are as follows:

- . The routing configuration should focus on the Central Area, as nearly 80 percent of the peak-hour transit trips could relate to this area. This is based on the assumption that all transit trips originating/destined outside the Community will interchange between the local and regional transit services in the Central Area.
- . Since so many peak-hour transit trips may be destined to or originating from outside the Community, the travel time from the residential areas to the Central Area should be as short as possible. This emphasizes the requirement for good coverage and high transit operating speeds. The coverage and frequency of service criteria listed under the Minimum Policies are intended to reduce the walk and wait time to a practical minimum. The routing and preferential treatments in the Central Area should permit the attainment of above-average operating speeds on the system.
- . As the Central Area with its regional transfer opportunity is expected to attract more than ten times the number of



Fig. 4

P.M. Peak Hour
Transit Trip Distribution
(NPP Oriented)

See note, Fig. 2

total daily trips generated by any other single employment area, service to the outlying industrial areas should be provided independently from the regular services. It would not be possible to provide attractive service to these areas using a routing system which must focus on the Central Area.

- . The uncertainties of the demand estimates dictate that the system developed must be sufficiently flexible to be responsive to possible changes in the magnitude and the distribution of demand. A transit network based on modern, attractive buses appears to offer the flexibility to adjust service to demand, particularly during the staging of the Community development.

2.3 THE SUGGESTED INTERNAL TRANSIT NETWORK

The suggested routes and schedules are described in this section. These were developed based upon the recommended Operating Policies and the implications of the demand characteristics.

The design of the internal transit system was based on the following principles:

- . Providing a direct, convenient route to the residential areas by focusing all routes in a radial pattern on the Central Area.
- . Establishing of focal points at the outlying Secondary Centres to provide direct, convenient service to these centres from the surrounding residential areas.
- . Providing capacity to meet the estimated demand.

- . Developing a system which would be sufficiently flexible to respond to changes in the magnitude and distribution of demand.

The major conclusions from the design of transit routings indicated:

- . Adjustments in the arrangement of land-use densities would not cause significant changes in the routing configuration, providing the overall accessibility to these developments was not disrupted.
- . By and large, changes in the internal road hierarchies have little influence on the transit routing configuration; rather it is the type of development adjacent to, and the access allowed from the road which determines the transit routings.

Regular Fixed Route Network

The conceptual routing system is illustrated in Figure 5. The basic service characteristics are listed below:

Number of routes	5
Route miles	48.0 miles
Average system operating speed	13.0 mph
Number of vehicles in service	22 vehicles
Hours of service	18 hours
Frequency of service - Peak:	10 minutes
- Off-Peak:	30 minutes
Estimated annual vehicle miles of service	800,000 miles
Estimated annual operating cost	\$1,000,000
Estimated annual revenue passengers	5,600,000



Fig. 5

Conceptual Routing System

The annual operating cost was estimated using a unit cost of \$1.20 per vehicle-mile. The ridership estimate is based on a 10 percent weekday modal split to transit. No attempt has been made to estimate operating revenues or deficits as this could be misleading without considering the cost and revenue related to the regional transit system.

Incorporated into the design of the system are the following features:

- . Through routing of all services through the Central Area on an exclusive transit right-of-way.
- . The provision at the Central Area of a terminal transfer facility between the local and regional transit services.

Industrial Transit Services

The successful operation of transit services to industry requires providing convenient, direct service with scheduling specifically designed to meet the working hours of the employees.

Consequently, service to industry should be provided independent of the regular service. When the need for industrial service arises the employees should be consulted to determine their willingness to support the service and to obtain their comments on routes and schedules.

To improve the efficiency and attractiveness of the service, attention should be given to arrangement of industrial plants and offices in the industrial parks. If possible, provision should be made for transit to bring the employees within convenient walking distance of their work locations on a continuous route through the industrial area. Figure 6 illustrates the suggested concept.



Fig. 6
Typical Industrial Route

Preferential Treatment For Transit

To determine possible areas for the development of exclusive transit rights-of-ways and reserved lanes, a demand-sensitivity analysis was completed assuming a 15 percent daily modal split combined with a 30 percent peak-hour modal split. It was decided that preferential treatment should be given in those corridors in which the ridership capacity of the buses exceeded the automobile capacity of one lane of traffic during the peak hour, at the assumed automobile occupancy. Even at this optimistic ridership level, there were no corridors which exceeded the warrants except some short stretches immediately adjacent to the Central Area.

However, apart from demand, there is justification for providing preferential treatment in specific areas to ensure regularity of service and allow higher average system operating speeds. The following specific steps are suggested:

- . Exclusive transit right-of-way through the Central Area.
- . Preferential treatment to allow access to industrial plants and offices in the outlying employment areas.
- . Transit should be allowed direct access to the Secondary Centres either by priority measures on site or by virtue of the centre design.

2.4 DISCUSSION OF MODAL SPLIT ASSUMPTIONS

As outlined previously, the estimates of transit use are affected by a number of factors which are difficult to predict. To gain an appreciation of the probable range of ridership, four modal split scenarios were examined.

Modal Split
Assumption

Regional Transit Scenario

5%	ICTS not extended to NTIA; bus connection to Liverpool Road GO Station.
7%	ICTS extended to NTIA but no penetration of Community; indirect or limited commuter rail services available.
10%	ICTS extended to NTIA with stops provided within the Community; express bus service to Oshawa-Whitby.
15%	ICTS extended to NTIA with stops provided within the Community; express bus service to Oshawa-Whitby; limitations imposed on the use of the automobile.

The effects of these assumptions are given below:

TABLE 5

IMPLICATIONS OF MODAL SPLIT ASSUMPTIONS
ON INTERNAL TRANSIT SYSTEM

	<u>Percent Daily Modal Split</u>			
	5%	7%	10%	15%
Daily Ridership	8,600	12,100	17,200	25,800
Peak Number of Vehicles in Service	9	13	22	36
Peak Frequency of Service* (Minutes)	30	20	10	6

* Average frequency based on demand

The increase in ridership throughout the range of modal split affects the frequency of service and the number of buses in service, but the basic route configuration would not be altered. It may be possible at the upper end of the ridership range to develop express bus services which circulate locally in the Community and then operate express outside the Community to a major regional employment centre. The possibility of this service can only be determined after the demand pattern has been established. As stated previously, the upper range of ridership would not justify preferential treatment for buses on a demand basis.

2.5 LAND USE DISTRIBUTION IMPLICATIONS ON INTERNAL TRANSIT NETWORK

In a community of 75,000 population, the likelihood of developing a strong corridor based on internal demand alone is remote.

An analysis was made on the possible relocation of up to 30 percent of the medium density housing. The effect on the route configuration and level of service was minimal. In this situation it is desirable to distribute the demand evenly over the routing system. This develops a balance of demand each side of the system focal point and allows through routing of service. In addition, it allows demand on each route to more closely match the capacity provided by the policy headways.

The comments made above are valid if the Community is ever expanded westerly to accommodate more than 75,000 residents. One possible exception would be the location of an additional stop on the ICTS near the Toronto Zoo. If the degree of self-containment does not change, this regional stop would rival the Central Area in terms of transit attraction. However, it would be difficult to provide convenient local service to both stops using a single routing system focused on the Central Area.

In summary, the continuity of the routing depends on the accessibility of the population to the transit system. The minimum policies on transit coverage will provide a high level of accessibility to residents if the design of the local street system and pedestrian access allows the development of an efficient transit routing.

2.6 CENTRAL AREA DESIGN

The Central Area design should incorporate a separate transit right-of-way to allow convenient access to the business and commercial areas to ensure regularity of service and allow higher average system operating speeds.

Another important feature to be included is a transit passenger terminal. The space allowed should accommodate the assembly of 10 vehicles at a population of 75,000. The terminal should allow convenient transfers between the regional and local service.

The terminal should be located as close to the centre of the complex as possible. The design of the Central Area should be compact to eliminate the need for a central distribution system. At a potentially higher population level, the total ground space devoted to Central Area activities will not increase much since the development of additional facilities will be mainly on second and third levels.

2.7 INTERNAL ROAD NETWORK IMPLICATIONS

The earlier traffic analysis for the road network study assumed a 13 percent peak-hour modal split to transit. The transit analysis indicates that this was a reasonable figure for planning of the road network. The variation of the modal split to transit between upper and lower limits will have little effect on the sizing of the internal roadway facilities, particularly the right-of-way to be preserved.

2.8 STAGING OF TRANSIT SERVICES

Transit services must be introduced at the outset of the Community's development. If this is not the case, it will not be possible to attract the widest possible range of residents.

The transit demand will consist of work trips and trips for shopping, social and recreational purposes. Express services from the Community to the GO-Transit station at Pickering should be introduced during the initial residential development. The development of an internal fixed-route system should be delayed until significant commercial, institutional and recreational facilities have been established, but there will probably be a significant role for dial-a-bus systems in the earliest stages.

Care should be taken in the staging of the internal road network to ensure the provision of an efficient transit routing system is possible during each stage.

Until the ICTS route is extended to the Community, the regional transit services will have to be developed based on the use of express bus routes to other parts of the Region. The express services to GO-Transit should circulate through the residential areas and then operate without stopping to the Pickering station. This will provide a more attractive interim service than a system requiring a transfer between the local and express buses in the Central Area.

It would seem inappropriate to consider that a transit operating authority should be set up to serve only the North Pickering Project. The more economic course would seem to be to contract for service from the Town of Pickering. Some formula would have to be found to offset the additional capital and annual costs incurred. Clearly, the Community would always want to set its own level of service, but just as clearly the operator must not be placed in a disadvantageous position leading possibly to withdrawal of services, which would have serious consequences in North Pickering.

3. IMPACT OF REGIONAL TRANSIT SYSTEM

This section outlines the implications of the regional transit system on the Community structure with a view to establishing the sorts of decisions required from outside agencies.

Fundamental to this discussion is the assumption that there will be some form of regional transit service connecting the Community with the major regional centres.

The following are some basic options:

- . Express bus service from the Community connecting to GO-Transit.
- . Express bus service from the Community to the major regional employment centres.
- . Extension of the Northeast Corridor ICTS through the Community to the Airport with express bus service to Oshawa-Whitby.

The first option cannot be considered as anything more than an initial phase of regional transit service. The second option would probably be provided if the ICTS were not extended to the Community and sufficient demand developed within it for service to specific regional employment areas. These first two options would have little effect on the Community structure due to the limited potential to provide a high level of service.

Consequently, the ensuing discussion focuses on the potential effects of extending the ICTS into the Community. The possible implications of the regional ICTS are presented under the following headings:

- Constraints on internal transit network
- Town structure elements sensitive to regional system
- Preferred regional transit corridors

3.1 CONSTRAINTS ON INTERNAL TRANSIT NETWORK

The local system should be fully integrated with the regional system to provide attractive service. Consequently, the local system should focus on the regional transit stop located within the Community. Logically, the regional stop should be incorporated into the Central Area to allow the local system to provide convenient service for the bulk of the local transit demand.

If at some future time a decision were made to expand the Community there would be a possibility for an additional regional transit stop within the Community in some other location. In this event it would be preferable to develop the stop as a park-and-ride and/or kiss-and-ride facility to avoid the development of a complicated and possibly inefficient internal system serving two major focal points.

3.2 TOWN STRUCTURE ELEMENTS SENSITIVE TO REGIONAL SYSTEM

The regional transit stop within the Community should be located in the Central Area. The design and layout of the Central Area should permit the development of an integrated, efficient transit terminal.

The remainder of the community elements are not basically affected because it is the presence of the terminal which influences community structure. Sufficient right-of-way should be provided along the north-south arterial road connecting the Central Area and the northern industrial park (We suggest an additional allowance of 30 feet).

The ICTS should be grade separated through the Community to avoid conflict with roadway and pedestrian facilities. Selected performance specifications are given below for two types of ICTS technologies.

SELECTED PERFORMANCE SPECIFICATIONS

	<u>GO-URBAN</u>	<u>LRT</u>
<u>Speed</u>		
Maximum operating speed	50	50
<u>Curve and Grade Limits</u>		
Minimum vertical radius	1000	1000
Minimum horizontal radius	100	40
Maximum grade	6.5%	6.0%
<u>Right-Of-Way</u>	Segregated R.O.W. not required if elevated; at-grade operation minimum R.O.W. requirement is 30'	24' (2-Track R.O.W. width on tangent net minimum)

3.3 PREFERRED REGIONAL TRANSIT CORRIDORS

As outlined previously, Metro and the Province have under consideration the construction of an intermediate capacity rapid transit system to serve the North-East Corridor. If this line were built it would seem feasible to extend it to the new Toronto International Airport.

The possible corridors for this extension are illustrated in Figure 7.

The preferred ICTS alignment, Corridor C, offers the following major advantages over the other alternatives:



Fig. 7

I.C.T.S. Options (Diagrammatic)

- . It increases the potential to attract office, professional and technical employment within the Central Area of the Community.
- . It strengthens the economic links between the Community and the Airport. Hotels and other services could be located conveniently in the Central Area and the Community's main office and industrial areas would be close to the Terminal.
- . It offers more direct access to the employment areas in the Region for the residents of the Community and, in addition, provides greater accessibility to Community job opportunities.
- . The location of the connection between the regional and local transit networks in the Central Area allows the development of a more convenient and efficient internal transit system. The provision of a regional transit connection outside the Community would require an additional service between the Central Area and this location; this would be unattractive because of the need to transfer and the longer travel time involved.
- . The alignment concentrates the regional public transit services in one corridor through the Community. This helps in coordinating the local transit and regional services to NTIA, Metro and Oshawa-Whitby.



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